

Children's Health Protection Advisory Committee

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July 8, 2022

Administrator Michael Regan
United States Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

RE: Take-Home Pesticide Exposure

Dear Administrator Regan,

The Children's Health Protection Advisory Committee (CHPAC) supports the Environmental Protection Agency's (EPA) efforts to assess and reduce risks from the pesticide "take-home," or "para-occupational," exposure pathway. Take-home exposures occur when pesticide residues are transferred from the workplace to the household environment via workers' clothes, shoes, skin, and vehicles. In this letter, the CHPAC responds to charge questions ([Attachment 1](#)) from the Agency on take-home exposures and children's health protection.

While pesticide residues may be transferred into children's environments from a variety of occupational settings in which pesticides are used or present, our responses to the charge questions focus on the agricultural workers (herein referred to as "farmworkers") that fall under the purview of the Worker Protection Standard (WPS),¹ EPA's regulation designed to protect workers and their families from pesticide illness and injury.

There are an estimated three million farmworkers in the U.S.,² and children are commonly present in farmworker households. The National Agricultural Workers Survey (NAWS) finds that 50% of farmworkers are parents and 62% of farmworkers live with their nuclear family,³ which highlights the high and widespread potential for take-home exposures. Additionally, anywhere from 200,000 to 500,000 children under the age of 18 work in agriculture.⁴ Children are particularly vulnerable to pesticide take-home exposure due to their unique behaviors, exposure routes, developing bodies, and dependence on adults to reduce their risk of harm. Children's health also encompasses the health of people of reproductive age, pregnant people, and the period of prenatal development. Pesticide exposure during pregnancy and early childhood has been associated with childhood cancers, adverse neurodevelopment, and other harm.⁴⁻⁹

Farmworkers are an economically vulnerable population, with about 30% of migrant workers earning family incomes below the U.S. Department of Health and Human Service's poverty threshold.¹¹ Disparities in pesticide exposures among farmworkers and their families disproportionately impact Black, Indigenous and People of Color (BIPOC) with about 77% of farmworkers identifying as Hispanic or Latinx.¹² Farmworkers are also a marginalized population, frequently without legal work authorization, job security, access to benefits, or English proficiency. These

vulnerabilities and systemic barriers faced by farmworkers must be considered in both the assessment of take-home exposures and development of mitigation approaches.

Our approach to developing recommendations to reduce take-home exposures was based on the Hierarchy of Controls framework, a well-established method for controlling occupational hazards.¹³ In this framework, eliminating and reducing hazardous pesticide use, or substituting hazardous pesticides with safer alternatives, are upstream strategies that would most significantly reduce harmful take-home exposures. These interventions would also reduce other types of pesticide exposures, providing additional benefits. Extensive peer-reviewed literature exists on practices that reduce pesticide usage without reducing yields, such as integrated pest management (IPM), organic, and agroecology approaches. EPA should work with federal, state, and tribal partners on strategies to promote IPM in agriculture, with an emphasis on reducing use of pesticides with hazards of greatest concern for children's health.

Question 1: EPA/OPP has provided and summarized for the committee available information on take-home pesticide exposure, focusing on systematic reviews in the published literature, farmworker responses to hygiene-related survey questions, and pesticide incident reports. Please provide additional currently available information on take-home exposure that EPA/OPP has not already identified.

EPA's summary presented to the CHPAC focused largely on characteristics of children that may influence their susceptibility to take-home exposures, such as the age of the child, with exposure potentially higher for toddler-aged children.¹⁴ The CHPAC recommends that EPA should also fully characterize how social, demographic, and economic factors may influence the likelihood and magnitude of farmworker take-home exposures. One of the articles included in the systematic reviews cited by EPA is Kalweit et al. (2020), which summarizes key social factors, structures, and power relationships that influence take-home exposures.¹⁵ These systemic and structural factors are useful to identify worker populations at higher risk of transferring pesticide residues from the workplace to home; however, it is unclear to what extent EPA considered these factors. EPA can use this information both in risk evaluation (see response to Question 3) and to target EPA's efforts on disseminating pesticide safety and hygiene messaging to the most at-risk populations (see response to Question 4).

Housing characteristics can modify the take-home exposure pathway. Physical characteristics of the home can directly influence pesticide residue levels and can also influence an individual's ability to engage in behaviors that reduce exposures, such as washing clothes or storing work shoes in a separate space. Farmworker housing consists of a patchwork of types, including owner-occupied dwellings, rental units, and temporary labor camps. There are few studies that compare residential pesticide levels in homes that are owned, rented, or provided by the employer; or that compare aggregate housing to single family dwellings. Aggregate housing has shared common areas, which likely increases the risk of contamination from multiple workers/families. Joyner et al. (2015) describe the conditions within Occupational Health and Safety Administration (OSHA)-regulated farmworker labor camps, a type of aggregate housing, in detail: "Ratios of occupants per shower are high (one shower for every ten occupants) (USDOL 29 CFR §1910(f)(1)(ii)), making a long wait for a shower upon return from work the norm. This leads to more pesticide contamination in living spaces while workers await their turn to bathe...Workers should shed the clothing they wear in the field and bathe immediately upon return, without entering the living area, but current standards impede this. Standards do not require access to outside showers, temporary storage spaces for contaminated clothing outside of living areas, or facilities for storing bath supplies and clean clothing in or adjacent to bathhouses or bathrooms. Current regulations do not even mandate a place to store work boots before entering living areas. OSHA requires one laundry tub for every thirty workers (USDOL 29 CFR §1910.142d). Advocates observe that many, if not most, camp owners do not provide washing machines and when they do, there are

not enough to meet the needs of all the occupants.”¹⁶ In summary, current OSHA standards and housing conditions do not allow farmworkers to enact EPA’s WPS training and guidance. Regardless of housing type, farmworker housing is generally substandard and subject to overcrowding, which likely increases pesticide residue levels in the home.^{16; 17} The NAWS reports that 30% of farmworkers live in crowded dwellings.³ Given the potential for take-home exposures due to housing characteristics, we recommend that EPA consider currently available information on housing-related factors as part of its review and include these factors in its mitigation strategies.

Vehicular transport of farmworkers and their families also contributes to pesticide take-home exposure but was not noted in the summary presented by EPA. Children are exposed both when riding in family vehicles contaminated with pesticide residues and when family members bring residues from the vehicle into the home. Studies have found the concentrations of pesticides in vehicle dust to be similar to or greater than those found in the homes.¹⁸⁻²⁰ Farmworkers often carpool to and from worksites due to lack of individual transportation, increasing transfer of residues on workers to the vehicle interior and exposure of all future passengers. Vehicular transport should be considered as part of the take-home exposure pathway, and mitigation strategies that prevent contamination of vehicles should be evaluated.

Other important characteristics that influence the likelihood and magnitude of take-home exposures include: job function (with higher exposure potential in homes of pesticide handlers compared to post-application workers²¹⁻²⁷); worker age (with younger workers more at risk²⁷); work arrangement (with seasonal and temporary workers more at risk²⁸); immigration status (with immigrants and non-U.S. citizens more at risk²⁹); and company size (with workers at small companies more at risk²⁷). Gender may also influence the transfer of pesticide residues from the worksite to children. Women may be more likely to pick children up from school or daycare immediately after work, and women may have greater responsibility for handling contaminated clothing of their partners.³¹

To address EPA’s specific request for additional currently available information, we suggest a few specific articles that may not have been considered in EPA’s literature reviews. Jones and Burstyn (2018) developed a conceptual model for take-home exposure, addressing the multiple pathways by which this occurs.³¹ Deziel et al. (2019) created a “quantitative, active ingredient-specific algorithm” for estimating non-occupational pesticide exposure intensity for spouses of farmworkers.³² Teyssie et al. (2020) reviewed 151 studies published between 1988 and 2019 characterizing residential exposure to pesticides to inform a systematic review of non-dietary exposure to populations near agricultural fields, including farm families (described in the response to Question 2 below).³³ We also recommend that EPA consider studies conducted outside of the U.S., which may include relevant information on the take-home exposure pathway.

Question 2: EPA/OPP has presented a summary of key conclusions from the available information on take-home exposure, which document that take-home exposures can occur, and that behavioral interventions can be effective. Please comment on the strengths and limitations of how well the available information describes the prevalence and extent of the take-home pathway and the effectiveness of behavioral interventions intended to reduce take-home exposure.

Strengths and limitations of the available information to describe the prevalence and extent of the take-home pathway

The CHPAC considers the existing research described in the literature to be a valuable and robust source of information on take-home exposures. One strength of the existing literature is the consistent evidence that take-home exposures occur and put children at risk of potential health effects. Studies demonstrate that children of farmworker families are exposed to greater pesticide levels in their homes and have higher levels

of pesticide metabolites measured in their urine compared to children from non-farmworker families.^{18; 20; 36; 37} Take-home exposures have been shown in studies conducted across a variety of agricultural communities, geographic areas, and agricultural operations. Another strength of the available information on take-home exposures is the inclusion of a range of exposure methods, including the measurement of pesticides in house dust, surface wipes, and human biospecimens (e.g., pesticides in children's urine). Finally, intervention studies have documented that the take-home pathway can be interrupted.

A major limitation of the existing evidence is the inability to isolate take-home exposures from those resulting from agricultural pesticide drift and volatilization and residential pesticide use. For example, studies document that airborne movement of pesticides via drift and volatilization leads to higher dermal, inhalation, and oral exposures by contributing to concentrations in indoor dust.³⁸ These combined residential exposures contribute to children's overall exposure, which includes pesticides in food and drinking water.^{39; 40} There is strong evidence that homes close to agriculture fields have higher pesticide residue levels. Some studies have sought to distinguish the contributions of pesticide drift and volatilization from the take-home pathway in contributing to residential exposures. Deziel et al. (2017) conducted a meta-regression on the relative contributions of agricultural drift, para-occupational, and residential use exposure pathways to pesticide concentrations in house dust.⁴⁰ The authors reported that distance from agricultural fields predicted home dust pesticide concentrations and that levels in homes were generally found to be highest during planting season. Teyssie et al. (2020) also reviewed factors associated with residential pesticide concentrations in published research articles.⁴¹ The studies reviewed identified the number of farmworkers living in the house as a major contributor to pesticide residential dust concentrations. There was also a strong relationship between proximity to local agricultural fields and the pesticides found in house dust, which underscores the contribution of the agricultural drift and volatilization pathways in overall pesticide exposure among people living near fields. We make further recommendations on integrating this information into EPA assessments in the response to Question 3 below. In our response to Question 4, we also recommend that EPA update the content of outreach materials to farmworkers and their families to include information on pesticide drift, volatilization, and residential pesticide use.

Effectiveness of behavioral and educational interventions to address take-home exposures

The committee appreciates EPA's emphasis not only on quantifying the prevalence and extent of the take-home pathway, but also on key areas of intervention that could potentially interrupt the pathway and result in decreased exposure potential for children. As noted above, elimination and substitution of hazardous pesticides are most effective in the Hierarchy of Controls. While personal protective equipment (PPE) and administrative controls (e.g., safety training) rank less effective, these more downstream interventions can also reduce take-home exposures. Bradman et al. (2009) demonstrated the effectiveness of glove use in reducing pesticide levels on hands and in urine.⁴² Salvatore et al. (2008) found that wearing clean work clothes reduced pesticide metabolite levels in farmworker urine,⁴³ and Salvatore et al. (2009) found that employer provided and laundered work clothing increased the likelihood of workers wearing clean clothing during working hours.⁴⁴ Currently, EPA does not require that employers provide post-application fieldworkers with gloves, work boots, protective clothing, or other PPE under the WPS. Without requiring PPE or mechanisms to change out of work clothes at the worksite, farmworkers will continue to wear their work clothing home, introducing pesticide residues into the home environment. An additional concern related to protective clothing stems from higher temperatures driven by climate change. Not only will this continue to increase heat-related illness and death among farmworkers,⁴⁵ excessive heat may also increase the likelihood that farmworkers will not wear the long-sleeve shirt and long pants that EPA currently assumes is worn in its risk assessments. We encourage EPA to continue to track and engage in research on clothing performance and comfort as related to both protection from pesticides and heat stress.

The effects of farmworker educational interventions are mixed. Thompson et al. (2008) did not observe any effect of extensive community, organizational, small group, and individual level educational interventions on biomarker levels of children in farmworker housing.²⁰ Salvatore et al. (2015) conducted an educational intervention study to address worker behaviors with only modest effects seen.⁴⁶ The authors emphasized that it is difficult to influence behaviors after workers leave the work site and that more upstream interventions are needed to prevent workers from wearing contaminated clothing home. Strong et al. (2009) also demonstrated modest effects of a behavioral intervention, with most positive change seen from taking work boots off before entering the home and changing out of work clothes within an hour.⁴⁷ Griffith et al. (2019) used community worker campaigns to interrupt the take-home cycle, which had a positive effect on reducing children's exposure to organophosphate pesticides.⁴⁸ Additional studies also demonstrate that interventions that include lay health advisors ("promotores") result in significant improvements in families' pesticide-related knowledge and practices.^{49; 50}

We agree with the conclusions in Salvatore et al. (2015) that it is difficult to influence behaviors of individuals after they leave their workplace. Further, farmworkers may have limited ability to enact "downstream" behavioral interventions. For example, post-application workers are responsible for their own work clothing, shoes, gloves, and head coverings and may have limited housing facilities to safely remove and clean these garments after shifts are over and before entering a vehicle or residential environment. Interventions in the workplace could include portable changing stations and the provision of clean gloves and protective clothing that would not be worn home.

There are important gaps in research on the effectiveness of behavioral/educational interventions. Longitudinal assessment of the long-term effectiveness of workplace and home-based interventions with appropriate comparison groups are needed. Additionally, few studies have been conducted on how to effectively remove pesticide residues once they are in the home from either take-home pathways or other sources.⁵¹ Studies that focus on the extent to which a worker can feasibly implement the WPS training's recommendations to decrease take-home contamination are needed. For example, in some of the studies of farmworkers' home hygienic practices,^{52; 53} workers re-wore clothing on multiple days, suggesting there may be structural and housing-related factors that prevent implementation of recommended practices by the workers on their own.¹⁵

Question 3: EPA/OPP discussed examples of ways in which it addresses indirect exposures from spray drift and volatilization. EPA/OPP currently addresses the take-home exposure pathway during risk management through training and safety requirements that limit the potential for workers to inadvertently expose their families. Please comment on additional research, data collection, or analyses not already addressed in the available literature that could help EPA/OPP quantify take-home exposures for regulatory purposes.

The CHPAC believes that EPA's current assessments conducted for regulatory purposes underestimate risks to children's health in agricultural communities because they do not consider the potential contribution of pesticide spray drift and volatilization to residential exposure (the latter is only considered in the context of bystander inhalation exposure). Further, the take-home pathway for farmworker families is not considered in EPA's regulatory framework. As described in our response to Charge Question 2, the evidence is clear that residential pesticide use, pesticide drift, volatilization, and take-home exposures all contribute to children's residential pesticide exposures. Since studies demonstrate that it is "difficult to determine the independent contributions of the take-home pathway in comparison to proximity to farms and residential pesticide use,"²¹ we recommend that EPA develop methods to jointly incorporate these exposure pathways in its residential risk assessments. Pesticide concentrations reported in the large body of research on farmworker and

agricultural community exposures (biomonitoring, ambient air monitoring, and indoor air and dust sampling) can be used in exposure assessments. If data are lacking, EPA could use surrogate data or adjustment factors to account for these known exposures as recommended by the National Research Council.⁵³ A framework to model pesticide exposures of residents that live in proximity to agriculture fields is also available.⁵⁴ This framework integrates individual models that are well-described in the literature to incorporate multiple residential exposure routes (e.g., spray drift, volatilization) into exposure estimates.⁵⁴ Our recommendation to use methods that integrate all pathways of pesticide exposure in agricultural communities into risk assessment is consistent with the Food Quality Protection Act (FQPA), which instructs EPA to ensure that “there is a reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue, including all anticipated dietary exposure and all other exposure for which there is reliable information.”⁵⁵

Question 4: In 2015, EPA finalized extensive revisions to the Agricultural Worker Protection Standard (WPS) at 40 CFR 170. EPA has undertaken efforts through several cooperative agreements and contracts to promote messaging about risks and the prevention of take-home exposures beyond what is required in the WPS. Please comment on additional approaches to disseminate pesticide safety and hygiene messaging aimed at take-home exposures and protecting children’s health.

EPA should include activities to both: (1) improve employer knowledge of and compliance with WPS requirements and (2) enhance outreach to farmworkers and their families.

Conduct outreach to employers to increase their pesticide safety knowledge and improve WPS compliance

Data from the WPS Compliance Monitoring Program show that employers frequently and consistently violate the legal requirements of the WPS.⁵⁶ States and tribes conduct the majority of inspections under the WPS Compliance Monitoring Program.⁵⁷ EPA’s WPS Dashboard compiles data from these inspections, including violations and enforcement actions.⁵⁶ Based on the most recent five years of data, about half of the operations inspected had at least one WPS violation, which is a very high rate.⁵⁸ The data also show that since 2015, when updates to the WPS were finalized, several requirements relevant to take-home exposures are amongst the most common violations reported, including:

- Pesticide safety training
- Central posting
- Personal Protective Equipment (PPE)
- Decontamination supplies

These types of violations increase the likelihood of take-home exposures. For example, if the employer does not provide decontamination supplies, workers are not able to wash their hands even if they understand that handwashing is important to reduce take-home exposures.

EPA should develop and implement initiatives to educate and engage employers on WPS requirements. The initiative can include both interactive trainings and informal information sharing through trusted messengers, such as Cooperative Extension agents. EPA should set compliance goals and a timeline for decreasing the number of violations reported, such as “Decrease pesticide safety training violations by 25% in two years.” Finally, EPA should evaluate how well the initiative is working by comparing WPS compliance data to goals, collecting feedback from participating employers, and modifying the initiative’s outreach strategies and training materials as needed based on the evaluation.

EPA should analyze WPS Compliance Monitoring Program inspection data to identify employer-level characteristics that are associated with WPS violations. For example, in other industries, smaller companies are more likely than larger companies to violate legal requirements related to worker protections, and it is reasonable to assume that a similar pattern may hold in agriculture.²⁷ This type of analysis would improve understanding of risk factors that could increase take-home exposures and allow EPA to target its outreach to the types of employers most in need of compliance assistance.

EPA funds the State and Tribal Assistance Grant (STAG) program, which supports WPS compliance monitoring, inspections, and enforcement activities. Based on the most recent five years of available data, only 1% of WPS-covered operations were inspected.⁵⁸ As such, EPA should assess each grantee's inspection capacity, including funding, and whether it is adequate to ensure employer compliance and safe working conditions for farmworkers. This recommendation is consistent with the recent directive issued by the Office of Enforcement and Compliance Assurance (OECA) to strengthen enforcement in communities with environmental justice concerns.⁵⁹ Since WPS inspections are not conducted at the vast majority of agricultural operations, EPA should endeavor to understand the gaps in the WPS Compliance Monitoring data and whether the data that are collected are representative of the broader industry.

One challenge in achieving widespread WPS compliance is that growers often hire workers through contracting companies and outsource WPS requirements (though ultimately the employer is responsible for ensuring WPS compliance). Contract workers may be temporary or seasonal, and often perform work for multiple growers within short time periods. There is little tracking or accountability to ensure that labor contractors are providing all workers with required training, decontamination supplies, etc., at work sites. Assessing WPS compliance among labor contractors is an area that EPA should prioritize in its employer outreach and engagement.

High-quality pesticide safety training tools should be disseminated to employers, and EPA should encourage employers to adopt effective training formats. For example, evidence indicates that culturally tailored, facilitator-led training results in better knowledge retention and greater pesticide safety behaviors.⁶⁰ The CHPAC supports the October 2021 recommendations made by the Farmworker and Clinician Training Work Group of the Pesticide Programs Dialogue Committee (PPDC) to EPA on evaluating and enhancing the appropriateness and effectiveness of farmworker protection activities.⁶¹ Among other constructive suggestions, the Work Group recommends that training: "incorporates relevant crops, pesticides, and types of application instead of a one-size-fits-all approach"; is "conducted where workers are comfortable"; and encourages questions and discussion. The Work Group also emphasizes the importance of involving farmworkers, farmworker organizations, and WPS trainers in EPA-funded projects that design, develop, review, and evaluate WPS training materials and in developing and conducting pre-training needs assessments. EPA should also consider expanding its partnership with farmworker training organizations, such as the Association of Farmworker Opportunity Programs (AFOP) and other organizations in which trusted community members serve as trainers/messengers. This recommendation is elaborated on in the following section on enhancing outreach to farmworkers and their families.

Enhance outreach to farmworkers and their families, including school-age children

While the CHPAC recommends that EPA prioritize outreach to employers and compliance and enforcement activities of the WPS, enhancing outreach to farmworkers and their families is also important. EPA has already implemented several successful activities in this area. Through cooperative agreements with the AFOP, UC Davis' Pesticide Educational Resources Collaborative (PERC), and Oregon State University's National Pesticide Information Center (NPIC), EPA has developed an array of educational resources for outreach to agricultural workers. These cover pesticide safety, including take-home exposures, based on the updated

WPS. Resources include video trainings, flipchart and pocket-sized brochures, fact sheets and flyers, and graphics for Twitter, Facebook, and Instagram. Resources are available in English and Spanish, and at least one resource, *Jose Learns about Pesticides* – an interactive storytelling curriculum – is targeted to children ages 4-10 years.⁶² In addition, EPA's multimedia campaigns, developed in collaboration with the Hispanic Communications Network and the CaseWay Agency, provided reach to Latinx populations, including those in agricultural communities, and with agricultural employers. EPA also sought input from organizations devoted to the health and safety of farmworkers, including AFOP and Farmworker Justice, and organized a Federal Interagency Task Force for strategic implementation. We applaud EPA's efforts to date.

There are some additional steps EPA could take to bolster these outreach activities. EPA should incorporate input from the Farm, Ranch, and Rural Communities Committee's (FRRCC) December 2021 recommendations⁶³ and from the PPDC to get additional stakeholder perspectives. Data from the NAWS indicate that while the majority of agricultural workers speak either Spanish or English as their primary language, 1-3% of workers speak indigenous languages.¹² In addition, there are significant differences in the Spanish language spoken in different countries, and there are other culturally and linguistically distinct racial/ethnic groups represented among U.S. farmworker communities. While EPA has developed "[Protect Yourself from Pesticides](#)" brochures and posters in multiple languages, these resources do not provide information about children's health, take-home exposures, and comprehensive actions to reduce them.⁶⁴ AFOP's [Limiting \[Pesticides\] Exposure Around Families](#) (LEAF) resources do provide this information in English, Spanish, Burmese, and Haitian-Creole. CHPAC recommends that EPA translate the LEAF resources and any other resources specific to take-home exposures and children's health into additional languages. This could be done in partnership with local organizations across the country that represent and support linguistically-isolated communities.

EPA should consider updating safety materials to include information on simple, free-to-low-cost actions that farmworker families can take to reduce exposures to pesticides from additional pathways, including food, drinking water, spray drift and volatilization, and residential pesticide use. For example, materials can include information about the importance of washing produce, testing private wells, staying indoors during periods of nearby pesticide application, and effective household IPM practices. EPA should use best practices to incorporate and disseminate these additional safety messages in a manner that is not overwhelming or burdensome for farmworkers and their families. The greater risk borne by these families from multiple pathways reinforces the critical need for EPA to strengthen upstream strategies.

All educational materials, such as scenario or story-telling vignettes, should be culturally relevant and provide real-world, applicable safety and hygiene tips appropriate for each group, including those aimed to English speaking, American-born farmworkers, who themselves are of diverse backgrounds. In addition, accessibility of these resources is critical. Materials should be accessible to schools and child care facilities in agricultural areas. We agree with the recommendation to EPA from the CHPAC in its December 2016 letter to ensure all resources are produced for a third grade reading level and include graphics and visuals for persons with limited literacy.⁶⁵ Webpages where these materials are housed should be user-friendly and ensure that the resources are clearly and immediately visible for viewing and download. In addition, EPA should ensure accessibility of materials and all technology used for communications, such as Information and Communications Technology (ICT), for individuals with disabilities in compliance with Section 508 of the Rehabilitation Act. Digital device technology changes rapidly, as does user adoption and use patterns. The NAWS new Digital Access Supplement (initiated in 2018) collects important information on digital access, types of devices used, and how farmworkers use their devices to access information or services. The [federal plain language guidelines](#) offer tips for web/online communication in addition to print communications, and [Section508.gov](#) provides tips for creating accessible electronic content for individuals with disabilities.

There are still many farmworkers, especially migrant and indigenous farmworkers, who lack digital access. Others who do have access may still prefer to receive health and safety information in hard copy formats or through in-person communication. EPA should continue to work with its regional coordinators, the Pediatric Environmental Health Specialty Units (PEHSUs), and other federal and nonprofit partners to ensure that regular trainings and dissemination of printed information on take-home exposures are conducted within farmworker communities through sustainable, effective programs. The research literature indicates that young workers, immigrants, and workers at small companies are the most at risk of taking exposures home with them. EPA should consider prioritizing outreach and dissemination to these groups to address exposure disparities.

We re-emphasize the need for EPA to incorporate the CHPAC's 2016 recommendations with regard to outreach to children and family members of family farmers who are not covered under the WPS but are equally vulnerable to potential take-home exposures.⁶⁵ EPA's 2017 response to the CHPAC stated that the Agency would incorporate the recommendations where possible, specifically in regard to the application exclusion zone requirements (AEZ) of the WPS.⁶⁶ In its messaging to family farmers, we encourage EPA to include not only reminders of complying with the AEZ requirements, but also information on proper hygiene behaviors to reduce take-home exposures. Some of these resources should be geared specifically to children.

Research has also shown that children can play a role in families' knowledge, attitudes, and behaviors, especially with regard to environmental concerns.⁶⁷⁻⁶⁹ Thus, enhancing education to children on how to reduce exposures may be a promising approach to improving families' adoption of pesticide safety and hygiene behaviors via intergenerational learning. EPA could produce new educational materials, enhance *Jose Learns About Pesticides*,⁶² or spin off additional resources from the latter such as a series of simple infographics, an activity workbook, or educational shorts on popular social media platforms.

EPA could enhance outreach to agricultural communities by sustaining existing partnerships and forging new ones with organizations, networks, and outlets that are trusted health messengers to farmworkers (especially migrant and undocumented farmworkers). These may include partnerships with health care, faith-based, labor, and farmworker justice organizations. EPA should continue to support and expand on (perhaps through the agency's environmental justice grants or through regional grants) successful evidence-based programs, such as those that recruit, train, and support the work of community health workers who are members of the same community in which they are trained to work. Well-designed lay health educator programs have proven effective at improving knowledge and influencing behavior change regarding pesticide use and safety.^{49; 70} CHPAC has included a list of stakeholders ([Attachment 2](#)) whose mission and work align with and could catalyze EPA's efforts to improve health protections for farmworkers and their families.

EPA should ensure that any educational outreach to farmworkers and their families is accompanied by outreach to employers to ensure that the latter adopt policies and provide services and materials that enable farmworkers to implement the education they receive. For example, outreach to pesticide handlers about changing out of work clothes and removing PPE on site before heading home would be accompanied by outreach to their employers emphasizing the WPS requirement to provide adequate "clean places for storing personal clothing and removing PPE." The educational materials for pesticide handlers should clearly describe employer requirements, to inform them of their rights.

WPS requirements and WPS-required training topics do not cover every aspect of take-home exposure. One example is vehicle transport. EPA should look for ways to educate and incentivize employers and workers to implement evidence-based best safety practices that extend beyond the current legal requirements of the WPS.

Conclusion

CHPAC appreciates the opportunity to respond to EPA's charge questions on pesticide take-home exposures. As EPA has demonstrated, the science is clear that take-home exposures occur, and current regulations are not adequate to disrupt the take-home exposure pathway. We recommend taking a multi-tier approach to interventions in the workplace, vehicles, and home that engage a variety of stakeholders (Figure 1). Interventions directed at the upstream part of the take-home exposure pathway (e.g., eliminating and reducing hazardous pesticide use) can most effectively reduce exposures in the home, including those from drift and volatilization.

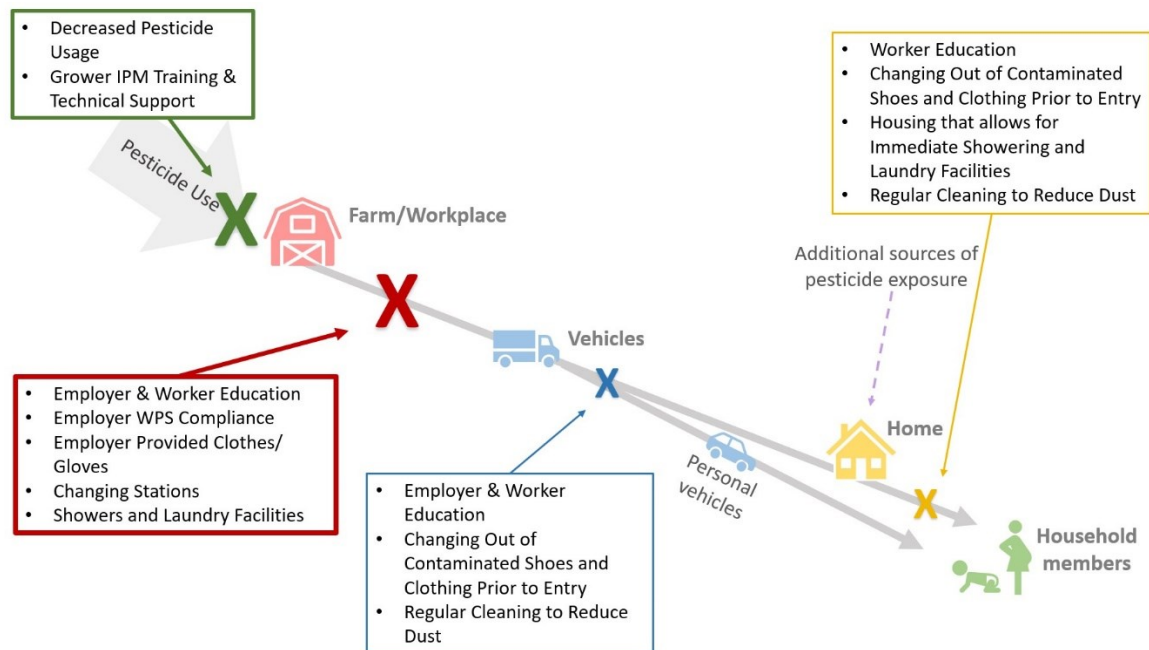


Figure 1. Suggested multi-tier interventions to disrupt the take-home exposure pathway. The size of the “X” indicates the size of the effectiveness of the intervention in reducing take-home exposures. The CHPAC recommends that interventions earlier in the pathway be prioritized. Additional sources of pesticide exposure include drift and volatilization, food and water, and residential pesticide use.

Our responses to EPA's charge questions include specific recommendations that are summarized below:

Questions 1 & 2: Incorporate current research on take-home exposures:

- EPA should review additional literature related to how worker demographics and social, systemic, and structural factors influence take-home exposures.
- EPA should include housing- and vehicle-related factors in its literature review.
- EPA should consider applicable studies on take-home exposures conducted outside of the U.S. in its literature review.
- EPA should support well-designed longitudinal behavioral intervention studies to assess their long-term effectiveness, sustainability, and feasibility.

Question 3: Assess risks to children's health by integrating multiple pesticide exposure pathways in residential assessments, including take-home exposures:

- To avoid underestimating health risks, particularly in agricultural communities, residential exposure assessments should integrate the take-home pathway, along with spray drift and volatilization and

home pesticide use, as appropriate. Following EPA's standard practices, these residential exposures would then be aggregated with other exposures including food and drinking water for populations in agricultural communities.

Question 4: Engage employers, farmworkers and their families, and other agencies in prevention of take-home exposures:

- EPA should develop initiatives to increase employer compliance with WPS requirements, especially targeted to the types of employers that most frequently violate the WPS.
- EPA should evaluate grantee WPS inspection and compliance activities under the State and Tribal Assistance Grant program and consider increasing funding to those with primary enforcement responsibility if current levels of funding are not adequate to increase WPS compliance rates.
- As research finds PPE reduces pesticide residues on workers, EPA, in collaboration with key farmworker partners and stakeholders, should examine the feasibility of interventions encouraging employers to maintain and, as necessary, replace gloves and other protective clothing for post-application workers.
- EPA should ensure educational materials on take-home exposures are accessible and available in the formats and languages relevant to farmworker populations and their children. Outreach should be targeted to segments of the farmworker population most at risk for take-home exposures.
- In addition to take-home exposure, training and educational materials designed for farmworkers and their families should include information on pesticide drift and volatilization and ways to reduce residential pesticide use.
- EPA should collaborate with farmworker organizations and partner agencies at the federal, tribal, state, and local levels to identify effective and appropriate actions to reduce exposures via the take-home pathway and to implement them.

Disproportionate pesticide exposures among farmworkers, their families, and agricultural communities have been documented for decades and continue today. As a health equity issue, reducing pesticide exposures among these groups should be addressed not only within the Office of Pesticide Programs, but as an Agency-wide effort to "take decisive action to advance environmental justice and civil rights." EPA's newly released Equity Action Plan⁷¹ can serve as a framework to develop and implement strategies to address this long-standing environmental justice issue.

CHPAC members have great respect for the farmworkers whose labor helps feed the world. Protecting the health of farmworkers and their families should be a priority for EPA and other government agencies on federal, state, tribal, and local levels.

Sincerely,



Deanna Scher, Ph.D.
Chair

cc: Jeanne Briskin, Director, Office of Children's Health Protection
Amelia Nguyen, CHPAC Designated Federal Official, Office of Children's Health Protection

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Attachment 1

CHPAC Charge – November 3, 2021

Background and Charge Questions from EPA/OPP – Take-Home Pesticide Exposure

As part of EPA's Office of Pesticide Program's (OPP) pesticide registration process, the Health Effects Division (HED) conducts human health risk assessments to evaluate the safety of existing or proposed pesticide products. The risk assessments mainly focus on exposures that result directly from use of the pesticide, such as dietary exposures from agricultural uses, worker exposures from applying the pesticides or re-entering treated fields, as well as exposures during or following use of household consumer use pesticides. While focusing on "direct" exposures, HED acknowledges that pesticide exposure can occur through many pathways; thus, over time, additional, "indirect", exposure pathways, such as spray drift and volatilization, have been included in EPA/OPP's regulatory process, from both a risk assessment and risk management approach.

The focus of this consultation is on the take-home, or "para-occupational", exposure pathway, which arises from the transfer of pesticide residues from the workplace to the household environment via agricultural workers' clothes, skin, vehicles, and shoes (López-Gálvez et al., 2019). While estimates of take-home exposure have been quantified in some cases, it is not a routine part of HED's risk assessments. Currently, EPA/OPP addresses take-home exposure in the risk management phase through education, outreach, and training requirements.

In 2015, EPA finalized extensive revisions to the Agricultural Worker Protection Standard (WPS) at 40 CFR 170 for the first time since 1992. Training and information sharing have always been an integral part of the WPS in protecting workers on an agricultural establishment. The 2015 WPS now requires annual training with enhanced content on a number of topics that relate to both children working at the establishment as well as those who may be impacted by take-home exposures by a parent or guardian. These topics include, but are not limited to:

1. Reducing pesticide residue exposure,
2. Potential hazards to both children and pregnant women, and;
3. Understanding and preventing take-home exposures on clothing or bodies.

EPA strives to ensure that educational materials meet the needs of workers and ensure that workers understand risks associated with pesticides residues. Given the potential effects of interventions as shown in the published literature, one of the goals of these trainings is to encourage behavioral shifts in hygiene practices after having worked with pesticides or in areas where pesticides have been used.

While WPS training is required annually, EPA has heard that more consistent and repetitive pesticide safety messaging is essential to ensure that safety practices both in the field and at home are understood and retained by members of the farmworker community. EPA has undertaken efforts through several cooperative agreements and contracts to promote messaging about risks and the prevention of take-home exposures beyond what is required in the WPS. These efforts include print ads about the WPS, radio spots with prevention messaging, and educational materials/pamphlets that can be used by Pesticide Safety Education Programs (PSEPs) and farmworker advocacy organizations, among others.

Responses from the CHPAC to the charge questions below will ensure that EPA/OPP has a comprehensive and reliable foundation of information on take-home exposure and obtains any recommendations for continuing to address take-home exposures in the regulatory process.

Materials for CHPAC Review:

- Presentation/Slides
- List of webpage references/links within slides
 - [EPA Efforts on Pesticide Spray Drift](#)
 - [EPA Efforts on Pesticide Volatilization](#)
 - [Standard Operating Procedures \(SOP\) for Residential Pesticide Exposure Assessment](#)
 - [U.S. Dept of Labor's National Agricultural Workers Survey \(NAWS\)](#)
 - [Presentation on Preliminary Findings from NAWS Hygiene Questions](#)
 - [EPA Hygiene Questions Codebook](#)
 - [Federal Register on 2015 EPA Worker Protection Standard Revision](#)
 - EPA Take-Home Exposure Outreach Efforts
 - [National Farmworker Training Program](#)
 - [Limiting Exposures Around Families](#)
 - [Pesticide Exposure & Pregnancy](#)
 - [National Farmworker Women's Health](#)
 - [José Learns About Pesticides](#)
 - [Pesticide Educational Resources Collaborative](#)
 - [WPS Social Media Toolkit](#)
 - [National Pesticide Information Center](#)
 - [Tips for reducing pesticide risk at work and at home](#)
- Systematic reviews of take-home exposure in published literature
 - Hyland C, Laribi O. Review of take-home pesticide exposure pathway in children living in agricultural areas. Environ Res. 2017 Jul;156:559-570. <https://doi.org/10.1016/j.envres.2017.04.017>
 - López-Gálvez N, Wagoner R, Quirós-Alcalá L, Ornelas Van Horne Y, Furlong M, Avila E, Beamer P. Systematic Literature Review of the Take-Home Route of Pesticide Exposure via Biomonitoring and Environmental Monitoring. Int J Environ Res Public Health. 2019 Jun 19;16(12):2177. <https://doi.org/10.3390/ijerph16122177>
- Dust Ingestion – Registration Review Response-to-Public Comments
 - <https://www.regulations.gov/document/EPA-HQ-OPP-2009-0056-0028>

Charge Question 1

EPA/OPP has provided and summarized for the committee available information on take-home pesticide exposure, focusing on systematic reviews in the published literature, farmworker responses to hygiene-related survey questions, and pesticide incident reports. Please provide additional currently available information on take-home exposure that EPA/OPP has not already identified.

Charge Question 2

EPA/OPP has presented a summary of key conclusions from the available information on take-home exposure, which document that take-home exposures can occur, and that behavioral interventions can be effective. Please comment on the strengths and limitations of how well the available information describes

the prevalence and extent of the take-home pathway and the effectiveness of behavioral interventions intended to reduce take-home exposure.

Charge Question 3

EPA/OPP discussed examples of ways in which it addresses indirect exposures from spray drift and volatilization. EPA/OPP currently addresses the take-home exposure pathway during risk management through training and safety requirements that limit the potential for workers to inadvertently expose their families. Please comment on additional research, data collection, or analyses not already addressed in the available literature that could help EPA/OPP quantify take-home exposures for regulatory purposes.

Charge Question 4

In 2015, EPA finalized extensive revisions to the Agricultural Worker Protection Standard (WPS) at 40 CFR 170. EPA has undertaken efforts through several cooperative agreements and contracts to promote messaging about risks and the prevention of take-home exposures beyond what is required in the WPS. Please comment on additional approaches to disseminate pesticide safety and hygiene messaging aimed at take-home exposures and protecting children's health.

Attachment 2

Stakeholder Information Pertaining to Charge Question 4

Health care organizations:

- [Pediatric Environmental Health Specialty Units](#) (PEHSUs)
- [Migrant Clinicians Network](#)

Faith based organizations:

- [National Farm Worker Ministry](#)

Farmworker or Labor rights organizations:

- [Farmworker Justice](#)
- [United Farm Workers](#)
- [Alianza Nacional de Campesinas](#)
- [Association of Farmworker Opportunity Programs](#)
- [Hispanic Federation](#)
- [Rural Coalition](#)
- [National Day Laborer Organizing Network](#)
- [Food Chain Workers Alliance](#)
- [Hmong American Farmers Association](#)

Education:

- [National Association of State Directors of Migrant Education](#)

Federal agencies/departments:

- [National Institute for Occupational Safety and Health \(NIOSH\)](#)
 - [The National Children's Center for Rural and Agricultural Health and Safety \(NCCRAHS\)](#)
- [US Department of Labor \(USDOL\)](#)
 - [Occupational Safety and Health Administration](#)
- [HHS Administration for Children & Families](#)
 - [Migrant Head Start](#)
- [US Department of Agriculture \(USDA\)](#)
 - [Safety in Agriculture for Youth \(SAY\) project](#)
 - [Special Supplemental Nutrition Program for Women, Infants, and Children \(WIC\)](#)

Media outlets or producers:

- [Telemundo](#)
- [Univision](#)
- [Entravision](#)
- [Spanish Broadcasting System](#)
- [Sesame Workshop](#), the organization that produces Sesame Street - has a history of educational videos for children on health issues. For example, healthy eating and exercise programming in the US to battle obesity, and Zika and malaria prevention messages to children in other countries.